Soft borders, bright colors: The cognition and metaphysics of everyday objects

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Everyday objects—shoes, ships, tables, cabbages and kings—are a basic part of the world according to our common sense view. But since the scientific revolution, our conception of these objects has been subject to revision by science and philosophy. Locke (1700) and others, relying on the science of the time, distinguished primary qualities such as solidity, mass and shape, which are in the object, from secondary qualities such as color, taste and smell, which are dependent on the observer. As science developed in the 20th century, special relativity told us that solidity and mass are relative to an inertial frame. Finally, Eddington (1928), in his famous discussion of the "two tables" contrasted the familiar substantial table with the scientific table. There is "nothing *substantial*" about the latter—it is mostly empty space. He concludes, with some regret, that science has shown by delicate experiment and remorseless logic that the scientific table is the only one that exists.

The central goal of my project is to reveal the flaws in these and other arguments (detailed below) against the significance of everyday physical objects. I do not question the physics, just an interpretation of its implications by most philosophers and many physicists. In Grandy (1989), I argued that the common interpretation that science shows objects are not colored—that there is no color in the physical world—is deeply flawed. By distinguishing two senses of color words, one that applies to sensations (perceptions?) and another that applies to objects, I was able to provide a coherent, if complex, account of a physical sense of color. Part of the current project is to develop a parallel response providing a more sophisticated understanding of what makes something substantial, to take seriously Eddington's regret.

But Eddington's is not the only attack on everyday objects. Later in the 20th century, philosophers also questioned the coherence of the conception of everyday objects from at least three other directions: arguments from vagueness—stemming from logic and semantics—held that ordinary objects are too ill-defined to have a place in a systematic ontological scheme (Unger, 1979); arguments from mereological essentialism—the view that all things that have parts have those parts necessarily—combined with the scientific observation that everyday objects change their molecular constituents, held that ordinary objects are metaphysical illusions (Jubien, 1997); and considerations of alternative conceptual schemes led to the belief that our usual way of carving the world was arbitrary and corresponded to no joints in nature (Hirsch, 1993).

The issue of whether there is a fundamental conception of physical object, prior to or independent of classification of that object as being of some particular kind, has been a topic of discussion in philosophy for decades, but also has recently emerged independently in cognitive psychology. Numerous ingenious experiments seem to demonstrate that ten-month-old infants can, for small numbers, keep track of how many objects are present in the environment, even when those objects are occluded from sight (Chiang and Wynn, 2000). However, up to at least 10 months of age, infants are impervious to radical changes as to the kind of object. For example, if they have seen a cup and a ball placed in a box, they are surprised if there is only one object there later; but they are not surprised if there are two cups, or two stuffed cats (Xu and Carey, 1996).

This leads psychologists to conclude that infants have an innate generic notion of object and to claim that this concept persists into adulthood (Spelke, 1990, 1994). Xu (1997) attempted to connect the psychological discoveries with philosophical issues showing that the accepted account of sortals (expressions that individuate objects) is mistaken. Her suggestions were met with hostility and misunderstanding, partly because she made the strategic error of claiming that the technical conception of object was one of the familiar senses of the word "object" in English (Hirsch, 1997; Wiggins, 1997). In response, I introduce the technical expression "Spelke object".

Though the precise formulation Xu gave was deficient in some particulars, a central part of my project is to complete her efforts to draw the philosophical consequences of the experimental work. Her attempt invoked four criteria: cohesion, boundedness, rigidity, and no action at a distance. Previously, when approaching the issues from philosophical motivations earlier, Hirsch (1993) arrived at a list of six criteria: boundary contrast, qualitative homogeneity, separate movability, dynamic cohesiveness, regularity of shape, and (in cases lacking boundary contrast) joint formation. Neither of these lists is adequate to characterize objects, as Hirsch himself concluded. Cats and blankets are objects in the required sense, but they are not rigid nor in any obvious sense regular in shape. Boundary contrast—a change of color at the edge of an object—is common but not ubiquitous. Qualitative homogeneity—sameness of color and

texture—is likewise common but not universal. Not acting at a distance is characteristic of the interactions among objects, but is not an intrinsic part of their characterization.

Both psychologists and philosophers have confused the question how we discriminate objects visually with the more fundamental question of how to characterize objects generically. The single criterion of *maximal dynamic cohesiveness*—meaning roughly that moving one part of the object tends to move it all—explains all of the other criteria to the extent they apply. A portion of matter is dynamically cohesive if a force acting on any part of it tends to act on all others; a portion of matter is maximal if it is not part of any larger portion that is cohesive. Emphasis on maximal dynamic cohesiveness explains why the generic concept of an object is important—objects are basic elements in our interaction with the world. Furthermore, the concept is either innate or learned very early because it is fundamental to interactions with the environment. Previous attempts to analyze the concept have focused on how we visually discriminate objects, but this puts matters backwards. It is important to discriminate objects visually because objects are those parts of the environment that "afford" the most effective ways of influencing the environment (Gibson, 1987). Visual perception is a tool to help us maneuver in and manipulate our environment, not an end in itself.

A deep connection relates the infant object concept to the most elementary part of physics: mechanics. The infant ability to track (small) numbers of objects disregarding their other properties closely parallels the fundamental notion of a point particle; the more sophisticated (but still very early) ability to understand more complex motions such as rotations and simple causal interactions closely parallels rigid-body mechanics. Idealized rigid bodies are defined as being maximal and infinitely cohesive. One goal of this project is to elucidate further the nature and significance of these parallels.

While the idea of maximal dynamic cohesiveness (and of rigid bodies) is a powerful explanatory one, making it precise requires considerable work. In particular, there are two approaches one can take: one that draws a sharp boundary on cohesiveness, another that accepts a fundamental vagueness in the idea. I will analyze both approaches but in the end argue for the latter. In support of this I have developed a novel account of the logic and semantics of vagueness (Grandy, 2001a). Extant philosophical theories of vagueness tend to fall into three camps: epistemicism (Williamson, 1994) denies that there is vagueness in language and locates all vagueness in our inadequate knowledge. Many-valued logics introduce variations on the basic ideas of truth and falsity but pay a high price in requiring revision in our familiar logical principles (Keefe and Smith, 1997). Few scholars find epistemicism satisfactory, but the main current alternative, supervaluationism (Fine, 1997), preserves classical truth at the cost of envisioning an implausible modification of language in which all expressions are entirely precise. I have developed a many-valued approach that does not require revision of our fundamental logic principles (Grandy, 2001a) and will argue that it provides the best account of vagueness.

The final undermining of everyday objects derives from considerations of parts and arbitrariness. Quine (1981) and others have concluded that the category of ordinary objects is too arbitrary and ill-defined to be of deep philosophical interest. Instead Quine suggests substituting the collection of all occupied space-time regions, however discontinuous and gerrymandered. My approach is to show that the Spelke objects are a significant subset of the Quinian objects (which need not be either maximal nor cohesive).and that, unless we recognize their status, we fail to describe important aspects of the structure of the world, namely those involving maximal cohesive objects.

Jubien (1997) and many others offer an alternative ontology based on the claim that metaphysically basic objects must not change their parts. Thus objects a la Jubien are collections of basic bits of matter. Since everyday objects change their parts, they are not included among the Jubien objects, which are neither cohesive nor maximal. Again the alternative ontology loses sight of the central importance of medium-sized objects that persist over time and have causal features.

These arguments enter into an already rich philosophical debate; more generally, my study suggests that the widely shared understanding of what "science tell us" about everyday objects is at best misleading and needs to be reconsidered. The chapters on vagueness develop a novel approach to describing the relation between language and the world that arguably resolves old familiar puzzles. My account of physical objects in terms of dynamic cohesiveness clarifies the claims of developmental psychologists and portrays more order in our fundamental concepts than has been acknowledged. It also characterizes the deep connection between the most elementary infant concept of object and the rigid bodies postulated by Newtonian mechanics. Finally, my project demonstrates that philosophically rigorous argumentation appealing to logical and scientific principles need not undermine common sense but can

both provide a deeper justification of the everyday and situate philosophy in the familiar world of people and things.

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